

INCH-POUND

MIL-PRF-1/1055F
16 December 2002
SUPERSEDING
MIL-PRF-1/1055E
27 August 1999

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, MICROWAVE (NEGATIVE GRID) TYPE 6442

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the electron tube described herein shall consist of this document and the latest issue of MIL-PRF-1.

DESCRIPTION: Triode, planar.

Dimensions: See figure 1.

Mounting position: Any.

Weight: 1 ounce nominal.

ABSOLUTE RATINGS:

Parameter:	Ef	F1	Eb	epy	Ec	Ehk	ib	Ib	Ic	ik
Unit:	V	GHz	V dc	kv	V dc	V dc	a	mA dc	mA dc	a
<u>Osc or amp 3/</u>										
Maximum:	5.7 4/	2.5	350	---	-50	±90	---	35	15	---
Minimum:	4.5	---	---	---	---	---	---	---	---	---
<u>Pulse modulated</u>										
<u>Osc or amp 5/</u>										
Maximum:	5.7 4/	2.5	275	---	-50	±90	---	35	15	---
Minimum:	4.5	---	---	---	---	---	---	---	---	---
<u>Anode pulsed</u>										
<u>Osc or amp 6/</u>										
Maximum:	6.3 4/	3.5	---	3.0	-100	±90	2.5 7/	2.5	1.25	3.75
Minimum:	5.7	---	---	---	---	---	---	---	---	---
<u>Class A RF amp</u>										
Maximum:	6.6	---	350	---	-25	±90	---	35	---	---
Minimum:	5.7	---	---	---	---	---	---	---	---	---
Test conditions:	6.3	---	350	---	Adj	---	---	35	---	---

See footnotes at end of table I.

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ABSOLUTE RATINGS: - Continued.

Parameter:	ic	Pp	Pi	tp	Du	tk	T(seal)	Barometric pressure, reduced
Unit:	a	W	W	μs	---	sec	°C 1/	mmHg 2/
<u>Osc or amp 3/</u>								
Maximum:	---	8.0	12	---	---	---	175	20
Minimum:	---	---	---	---	---	30	---	---
<u>Pulse modulated</u>								
<u>Osc or amp 5/</u>								
Maximum:	---	6.0	9.5	---	---	---	175	20
Minimum:	---	---	---	---	---	30	---	---
<u>Anode pulsed</u>								
<u>Osc or amp 6/</u>								
Maximum:	1.25	7.5	7.5	2.0	0.001	---	175	250
Minimum:	---	---	---	---	---	60	---	---
<u>Class A RF amp</u>								
Maximum:	---	8.0	12	---	---	---	175	20
Minimum:	---	---	---	---	---	0	---	---
Test conditions:	---	---	---	---	---	120 min	--- 10/	---

See footnotes at end of table I.

GENERAL:

Qualification: Required.

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TABLE I. Testing and inspection.

Inspection	Method	Notes	Conditions	Acceptance Level <u>20/</u>	Symbol	Limits		Unit
						Min	Max	
<u>Conformance inspection, part 1</u>		<u>12/</u>						
Pulsed oscillation	---	<u>14/ 15/</u>	F = 3.45 GHz (min); epy = 3,000 v; Rg/lb = 2.5 mA dc; tpv = 1.0 μ s \pm 10% trv = 0.1 μ s (max); tfv = 0.2 μ s (max); prv/Du = 0.001 \pm 5%; Ef = 6.0 V	0.65	Po	1.75	---	W (useful)
Insulation of electrodes	1211	<u>16/</u>	Ef = 6.3 V	0.65	Rgp Rgk	250 25	--- ---	Meg Meg
Emission	1231	---	Eb = Ec/lb = 40 mA dc	0.65	Eb = Ec	---	4.0	V dc
Pulsing emission	1231	---	Prr = 500 (max); tp = 1 to 3 μ s; Du = 0.0005 (min); eb = ec = etd/lb = 8a	0.65	etd	---	175	v
Electrode voltage (1) grid	1261	---		0.65	Ec	-2.5	-5.75	V dc
Total grid current	1266	---		0.65	lc	---	-0.5	μ A dc
<u>Conformance inspection, part 2</u>								
Electrode voltage (2) (grid)	1261	---	Ec/lb = 2 mA dc		Ec	-5.0	-11.5	V dc
Heater current	1301	---			lf	840	960	mA
Transconductance	1306	---			Sm	13,500	19,000	μ mhos
Resonance test	---	<u>8/ 13/</u>	No voltages		---	---	---	---
Amplification factor	1316	---			Mu	35	65	---
Direct-interelectrode capacitance	1331	---	No voltages; use shielded socket in accordance with Drawing 260-JAN. <u>21/</u>		{ Cgp Cgk Cpk	2.10 4.60 ---	2.45 5.45 0.045	pF pF pF
Heater-cathode leakage	1336	---	Eb = Ec = 0		lhk	---	100	μ A dc

See footnotes at end of table.

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TABLE I. Testing and inspection - Continued.

Inspection	Method	Notes	Conditions	Symbol	Limits		Unit
					Min	Max	
<u>Conformance inspection, part 3</u>							
Life test	---	---	Group C; t = 500 hours; pulsed oscillation	---	---	---	---
Life-test end point:	---						
Pulsed oscillation	---	---		ΔPo	---	25	%
<u>Periodic-check tests</u>							
Barometric pressure reduced (1)	1002	11/ 18/	Pressure = 250 mmHg (max); voltage = 2,000 V ac; TA = 30°C \pm 10°C	---	---	---	---
Barometric pressure reduced (2)	1002	11/ 18/	Pressure = 20 mmHg (max); voltage = 500 V ac; TA = 30°C \pm 10°C	---	---	---	---
High-frequency vibration	1031	17/	Ebb = 300 V dc; Ec/lb = 10 mA dc; Rp = 10,000 ohms; use socket in accordance with Drawing No. 261-JAN 21/	Ep	---	100	mV dc
Shock	1041	11/	No voltages; Accel = 400 G peak (min); 0.5 ms duration (min); use socket in accordance with Drawing No. 261-JAN 21/	---	---	---	---
Shock-test end points:	---						
Total grid current	1266			Ic	---	-0.6	μ A dc
Torque	---	9/ 17/	No voltages	---	---	---	---
Torque-test end points:	---						
Total grid current	1266			Ic	---	-0.6	μ A dc
Heater current	1301			If	840	960	mA

See footnotes at top of next page.

TABLE I. Testing and inspection - Continued.

- 1/ Sufficient conduction and convection cooling shall be provided to limit the envelope temperature to the specified maximum of 175°C under all operating conditions.
- 2/ Operation at this altitude is possible in a suitably designed circuit.
- 3/ Modulation essentially negative may be used if the positive peak of the audio frequency envelope does not exceed 115 percent of the carrier conditions.
- 4/ This tube operates at frequencies where transit-time effects of the electron current shall be considered. The principal effects influencing the tube operation are the decrease in power output and operating efficiency with increase in frequency, and the bombardment and heating of the cathode by electrons from the region of the grid, which can be sufficiently severe to result in short tube life and erratic operation. Operating frequency, circuit design and adjustment, grid bias, grid current, average power input and the operating voltage contribute to some degree to the magnitude of the resulting cathode bombardment. There is a heater voltage which will maintain the cathode at the correct operating temperature for a set of operating conditions. If the conditions of operation result in appreciable cathode back-heating. It may be necessary to initiate dynamic operation of the tube at normal heater voltage, followed by a reduction of heater voltage to the proper value. A maximum variation of ± 5 percent in heater voltage is recommended where consistent operation and extended tube life is a factor.
- 5/ Carrier conditions for use with a maximum modulation factor of 1.0.
- 6/ Tube shall not be operated for more than 6 microseconds in any 5,000 microsecond interval. Tube shall not be grid-pulsed beyond the CW ratings.
- 7/ The regulation or series-anode-supply impedance, or both, shall limit the instantaneous peak current, with the tube considered as a short circuit, to a maximum of 10 times the specified maximum current rating.
- 8/ Other tube contact configurations may be used provided the tube contact area remains unchanged and the socket, jig, or cavity gives equal performance. Mounting of the socket, jig, or cavity may be at the option of the manufacturer.
- 9/ Torque test shall be performed as follows:
 - a. A torque of 15 inch-pounds shall be applied between the anode and heater terminal No. 1 without shock. This is not a destructive test.
 - b. A torque of 5 inch-pounds shall be applied between heater terminal No. 1 and heater terminal No. 2 without shock. This is not a destructive test.
- 10/ During the test, the maximum temperature of any part of the envelope shall be limited to 175°C maximum by conduction or forced convection cooling.
- 11/ Perform test on 10 tubes selected at random from the first production lot of each calendar year. If one tube fails, the test shall become part of conformance inspection, part 2. Acceptance shall be based upon accept on zero defect ($c = 0$) sampling plan, in accordance with table III of MIL-PRF-1. After three consecutive successful submissions, the test shall revert to an annual 10-tube test.

TABLE I. Testing and inspection - Continued.

- 12/ All tests listed under conformance inspection, part 1, are to be performed at the conclusion of the holding period.
- 13/ Grid anode resonance: Test in cavity in accordance with DSCC Drawing No. D64102. Cavity shall resonate at 1.74 GHz \pm 2.5 MHz with tuning slug in accordance with DSCC Drawing No. B64103 at TA = 25°C \pm 5°C.

Grid-cathode resonance. Test in cavity in accordance with DSCC Drawing No. D64102. Cavity shall resonate at 1.793 GHz \pm 2.5 MHz with tuning slug in accordance with DSCC Drawing No. B64103 at TA = 25°C \pm 5°C.

When plotted on graphs of resonant frequency versus grid-anode capacitance and resonant frequency versus grid-cathode capacitance, the tube under test (TUT) shall be represented by a point within a parallelogram whose four corners are located by the following points:

Point	Capacitance (pF)		Frequency (GHz)	
	C-gp	C-gk	F-gp	F-gk
1	2.10	4.60	1.928	1.890
2	2.10	4.60	1.947	1.914
3	2.45	5.45	1.895	1.851
4	2.45	5.45	1.914	1.875

- 14/ Test in cavity in accordance with Drawing No. 253-JAN 21/. Measure useful power output with the coupling and tuning adjusted for maximum power output. The tube shall operate under the given conditions and after the required circuit adjustments for a minimum of 10 seconds without arcing or instability, as evidenced by pronounced variations in the average anode current meter or the power output meter. If temporary arcing does occur during the 10-second period, the tube shall subsequently operate for 60 seconds without arcing. The test may be discontinued at the end of the 10-second period if the power output has not completely stabilized but is rising. If the power output is falling, the test will be continued until a stable reading is obtained. For qualification purposes, a stabilized reading shall be obtained. All readings shall be "nonsquegging" power.
- 15/ The pulse characteristics are defined as follows:
- epy is the smooth peak voltage excluding spike (see method 1296).
 - The interval of trv and tfv is between 20 and 85 percent of the smooth peak value of the voltage pulse.
 - The definition of tp is applicable to tpv.
 - The parameter tpv, tfv, and trv may be measured with the tube replaced by a 1,000-ohm noninductive resistor.

The load VSWR shall be 1.5 maximum.

- 16/ The insulation between the grid and the cathode shall be measured with a voltage of 100 V dc. The other insulation test shall be made in accordance with method 1211.

TABLE I. Testing and inspection - Continued.

- 17/ This test shall be performed during the initial production and once each succeeding 12-calendar months in which there is production. A sampling plan shall be used, with a sample of six tubes having an acceptance number of zero defects. In the event of failure, the test will be made as part of conformance inspection, part 2. Acceptance shall be based upon accept on zero defects ($c = 0$) sampling plan, in accordance with table III of MIL-PRF-1. The regular "12-calendar month" sampling plan shall be reinstated after three consecutive samples have been accepted.
- 18/ The specified voltage shall be applied between anode and grid. No other voltages shall be applied. The TUT shall be excited under specified conditions at atmospheric pressure for 10 seconds minimum. There shall be no evidence of arc-over or instability as evidenced by significant variations observed in the waveform of the applied voltage. Should arcing occur during the 10-second period, the TUT shall subsequently operate for 60 seconds minimum without arcing. The pressure shall then be reduced to specified conditions and the TUT must operate for another 60 seconds minimum without visible arc-over.
- 19/ Revision letters are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.
- 20/ Acceptance shall be based upon accept on zero defect ($c = 0$) sampling plan, in accordance with table III of MIL-PRF-1.
- 21/ Direct questions about the availability of JAN drawings to the preparing activity: DSCC-VAT, Defense Supply Center Columbus, P.O. Box 3990, Columbus, OH 43216-5000.

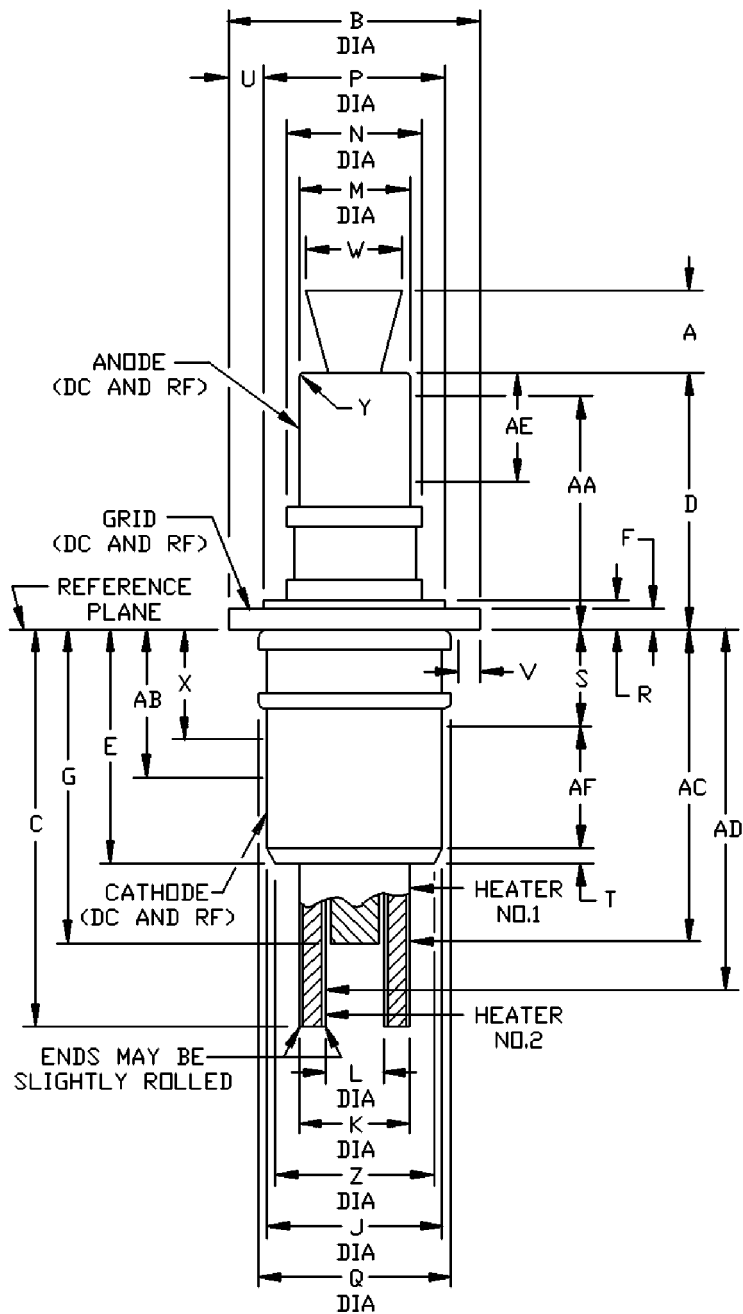


FIGURE 1. Outline drawing of electron tube type 6442.

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Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
Conformance inspection, part 2					
A	---	.250	---	6.35	
B	.810	.818	20.57	20.77	
C	1.219	1.281	30.96	32.53	
D	.953	.984	24.21	24.99	
E	.750	.813	19.05	20.65	
F	.070	.078	1.78	1.98	4, 5
G	---	1.016	---	25.80	
J	.539	.549	13.69	13.94	6
K	.318	.328	8.08	8.33	
L	.180	.190	4.57	4.82	
M	.365	.371	9.27	9.42	
AE	.429	---	10.90	---	4
Conformance inspection, part 3 (periodic check)					3
N	---	.453	---	11.50	
P	.560	.570	14.22	14.47	
O	---	.609	---	15.46	
R	.077	.097	1.96	2.46	
S	---	.266	---	6.75	
T	.015	.090	0.38	2.28	
W	---	.285	---	7.24	1
X	---	.375	---	9.52	7
Z	.490	.520	12.45	13.20	
Reference dimensions					
U	.094		2.39		4, 5
V	.094		2.39		4, 5
Y	.016 R		0.41 R		
AA	.750		19.50		2
AB	.547		13.89		2
AC	1.000		25.40		2
AD	1.109		28.17		2
AF	.453		11.51		4

FIGURE 1. Outline drawing of electron tube type 6442 - Continued.

NOTES:

1. Exhaust tubulation shall not be subjected to any mechanical stress.
2. Eccentricity shall be gauged at points designated and what shall be as follows (note 3 shall apply):

Contact	Eccentricity		Reference
	Inches	Millimeters	
Anode	.010 max	.25	Grid contact
Cathode	.010 max	.25	Grid contact
Anode-cathode	.020 TIR	.51	Grid contact
Heater No. 1	.015 max	.38	Grid contact
Heater No. 2	.015 max	.38	Grid contact
Heater No. 1 and 2	.030 TIR	.76	Grid contact

3. These dimensions shall be tested on 10 tubes per month when in continuous production. Failure of more than one tube to meet tolerances for any dimension shall cause that dimension to become, for all lots in process, part of conformation inspection, part 2.
4. Contact surface shall be confined to this area.
5. Only these surfaces shall be used for tube stops or clamping.
6. Maximum diameter shall not be increased by solder.
7. Tube marking shall be confined to this area.

FIGURE 1. Outline drawing of electron tube type 6442 - Continued.

Custodians:

Army - CR
 Navy - EC
 Air Force - 11
 DLA - CC

Preparing activity:

DLA - CC

(Project 5960-3617)

Review activities:

Navy - AS, CG, MC, OS
 Air Force - 19